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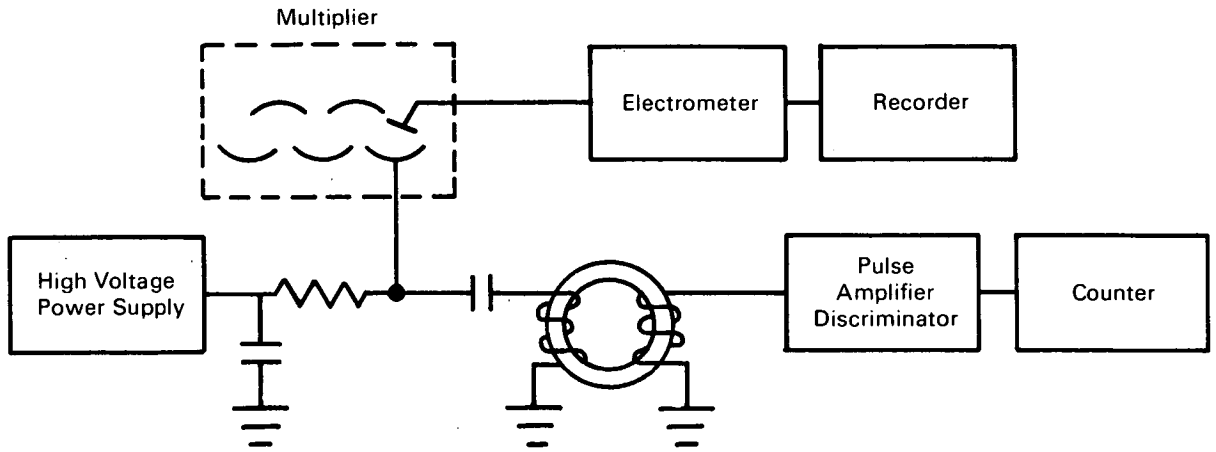
NASA TECH BRIEF

Apparatus for Simultaneous Ion Counting and Current Recording in Mass Spectrometry



Ion Counting System

Ion counting, rather than conventional electrometer methods, is often used to measure ion currents in certain mass spectrometry applications. The advantages of ion counting are: 1) very low ion intensities can be measured with increased precision and accuracy; 2) electron multiplier mass discrimination effects are eliminated; 3) detrimental effects of multiplier gain instability as a function of time are minimized; 4) relative multiplier gains can be measured for ionic species whose intensities are so low that no other method is applicable; and 5) data reduction and computer interfacing are simplified.

In high resolution mass spectrometry, ion counting is made especially difficult by the fact that instrument instabilities cause drifting from peak maximums where ion counting must be performed. Thus it is desirable that conventional electrometer monitoring be carried out simultaneously with ion counting. Simultaneous measurements cannot be made at the anode of the electron multiplier because the inputs of the two measuring systems are not compatible.

An ion counting system (see figure) has been adapted to an Allen-type electron multiplier on the mass analyzer of a commercial double focusing mass spectrometer. The ion counting system is coupled to the last dynode of the multiplier; this scheme leaves the anode available for the electrometer and thus simultaneous measurements can be made. Coupling is achieved by use of a miniature ferrite core transformer and associated circuitry. The negative pulses are conditioned by a high gain, high resolution pulse amplifier-discriminator and counted by a digital counter.

This system has a dead time of 8×10^{-7} seconds and has been used to measure mass spectrometer out-

(continued overleaf)

put ion currents in the range from 10^{-18} to 10^{-14} amperes.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
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Patent status:

No patent action is contemplated by NASA.

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